भारतीय मानक
Indian Standard

IS 249 : 2022

सोडियम बाइक्रोमेट, तकनीकी – विशिष्टता

(*चौथा पुनरीक्षण*)

Sodium Bichromate, Technical — Specification

(*Fourth Revision*)

ICS 71.060

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भारतीय मानक ब्यूरो
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Inorganic Chemicals Sectional Committee, CHD 1

FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Inorganic Chemicals Sectional Committee had been approved by the Chemical Division Council.

Sodium bichromate is used for tanning leather and for making chrome pigments by interaction with other salts. It also finds wide use in metal treatment for cleaning and producing corrosion-resistant films, to retard corrosion in refrigeration brines, air washers, condensers, automobiles, boilers, etc. In the textile industry, sodium bichromate is used in mordanting, dyeing and the manufacture of dyes. Other applications of sodium bichromate are in bleaching and purification of oils and fats, photography, wood preservation, adhesives and organic synthesis and manufacture of other chromium compounds.

This standard was originally published in 1951. In the first revision, sodium bichromate content was raised to 98.5 percent and the limits of impurities of sulphates and calcium compounds and the limit of free and combined water were reduced. In the second revision; requirements of matter insoluble in water and pH were added in order to ensure absence of chromate in the bichromate. In the third revision, the limit of sodium bichromate was further upgraded to 99.0 percent, and the limit for moisture was changed to 13.0 percent. Further, in this fourth revision, reference clause, packing and marking clause and instrumental test method for the determination of chlorides and sulphates has been incorporated.

The composition of the committee responsible for formulation of this standard is given at Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SODIUM BICHROMATE, TECHNICAL — SPECIFICATION

(Fourth Revision)

1 SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for sodium bichromate, technical.

2 REFERENCES

The Indian Standards given below contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

IS No.	*Title*
264:2005	Nitric acid - Specification (*third revision*)
265:2021	Hydrochloric acid - Specification (*fifth revision*)
266:1993	Sulphuric acid - Specification (*third revision*)
323:2009	Rectified spirit for industrial use - Specification (*second revision*)
1070:1992	Reagent grade water - Specification (*third revision*)

3 REQUIREMENTS

3.1Description

Sodium bichromate, technical, shall be in the form of orange red, non-caking crystals, free from foreign matter and visible impurities, and shall form a clear solution when dissolved in water.

NOTE — The material may form lumps if packed in gunny bags.

3.2 The material shall comply with the requirements given in Table 1 when tested according to the methods prescribed in Annex A. Reference to the relevant clauses of Annex A is given in col 4 of the table.

Table 1 Requirements For Sodium Bichromate, Technical

(*Clause* 3.2)

Sl No.	Characteristic	Requirement	Method Of Test. Ref To Cl No. In Annex A
(1)	(2)	(3)	(4)
i)	Free moisture and combined water, percent by mass, *Max*	13.0	A-2
ii)	Sodium bichromate ($Na_2Cr_2O_7$) content, percent by mass, *Min*	99.0	A-3
iii)	Sulphates (as Na_2SO_4), percent by mass, *Max*	0.65	A-4 and A-9
iv)	Chlorides (as NaCl), percent by mass, *Max*	0.50	A-5 and A-9
v)	Calcium compounds (as $CaSO_4$), percent by mass, *Max*	0.15	A-6
vi)	Matter insoluble in water, percent by mass, *Max*	0.05	A-7
vii)	pH value (of aqueous solution)	3.7 to 4.3	A-8

NOTE — Requirements against Sl No. (ii) to (vi) are on dry basis.

4 PACKING AND MARKING

4.1 Packaging

The material shall be packed in closed containers as agreed to between the purchaser and the supplier.

4.2 Marking

The packages shall be securely closed and bear legibly and indelibly the following information:

a) Name and grade of the material;
b) Name of the manufacturer and his recognized trade mark, if any;
c) Gross and net mass;
d) Date of manufacture and;
e) Batch number

4.2.1 *BIS Certification Marking*

The product may also be marked with the Standard Mark.

4.2.1.1 The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

5 SAMPLING

5.1 Representative samples of the material shall be drawn and the conformity of the material to the requirements of this specification shall be determined in accordance with the procedure prescribed in Annex B.

ANNEX A

(*Clause* 3.2)

METHODS OF TEST OF SODIUM BICHROMATE, TECHNICAL

A-1 QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities, which affect the results of analysis.

A-2 FREE MOISTURE AND COMBINED WATER

A-2.1 Procedure

Weigh accurately about 25 g of the material in a petri dish of about 10 cm diameter. Heat at 150 ± 1°C for one hour. When completely dried, cool in a desiccator and weigh. Repeat this operation till constant mass is obtained. Use this dried material for subsequent analysis.

A-2.2 Calculation

$$\text{Free moisture and combined water, percent by mass} = 100 \times \frac{M_1}{M_2}$$

where

M_1 = loss in mass in g, and

M_2 = mass in g of the material taken for the test.

A-3 DETERMINATION OF SODIUM BICHROMATE

A-3.1 Two methods are prescribed, namely, (a) Iodometric method, and (b) Permanganate method. Any one of them may be used.

A-3.1.1 *Iodometric Method*

A-3.1.1.1 *Reagents*

A-3.1.1.1.1 *Potassium iodide* — Crystals.

A-3.1.1.1.2 *Dilute sulphuric acid* — 1:3 (*v*/*v*).

A-3.1.1.1.3 *Standard sodium thiosulphate solution* — 0.1 N, freshly standardized.

A-3.1.1.1.4 *Starch solution*

Triturate 5 g of starch and 0.01 g of mercuric iodide with 30 ml of water in a mortar. Pour the resulting paste into one litre of boiling water, boil for 3 min, allow the solution to cool, and decant off the clear liquid.

A-3.1.1.2 *Procedure*

Weigh accurately about 2 g of the dried sample (*see* **A-2.1**) and dissolve it in 50 ml of water. Make up the solution to 250 ml. Transfer accurately 25 ml of the solution to a 250 ml iodine flask, and add 4 to 5 g of potassium iodide and dissolve by shaking. Add 10 ml of dilute sulphuric acid and let stand in dark for 10 min. Titrate the liberated iodine with standard sodium thiosulphate solution, using about 5 ml of starch solution towards the end, until the blue colour produced just disappears. One millilitre of 0.1 N sodium thiosulphate solution is equivalent to 0.004 37 g of sodium bichromate ($Na_2Cr_2O_7$).

A-3.1.1.3 *Calculation*

$$Sodiumbichromate\ (as Na_2Cr_2O_7) = \frac{43.7\ NV}{M}$$

where

N = Normality of standard sodium thiosulphate solution,

V = Volume in ml of standard sodium thiosulphate solution used in the titration, and

M = Mass in g of the material taken for the test.

A-3.1.2 *Permanganate Method*

A-3.1.2.1 *Reagents*

A-3.1.2.1.1 *Ferrous ammonium sulphate solution* — 0.1 N.

A-3.1.2.1.2 *Standard potassium permanganate solution* — 0.1 N.

A-3.1.2.2 *Procedure*

Weigh accurately about 2 g of the dried sample (*see* **A-2.1**) and dissolve in 50 ml of water. Make up to exactly 250 ml with water in a volumetric flask. Pipette out 25 ml of the solution in a conical flask and add to it 50 ml of ferrous ammonium sulphate solution. Mix well, add 25 ml of water and titrate against standard potassium permanganate solution till the colour changes at the end point from green to grey. Carry out a blank titration with 50 ml of ferrous ammonium sulphate solution against standard potassium permanganate solution. One millilitre of 0.1 N potassium permanganate solution is equivalent to 0.004 37 g of sodium bichromate ($Na_2Cr_2O_7$).

A-3.1.2.3 *Calculation*

$$Sodium\ bichromate\ (as Na_2Cr_2O_7),\ percent\ by\ mass = \frac{(V_1 - V_2)N \times 43.7}{M}$$

where

V_1 = Volume in ml of potassium permanganate solution required for the blank titration,

V_2 = Volume in ml of potassium permanganate solution required for the material,

N = Normality of standard potassium permanganate solution, and

M = Mass in g of the material taken for the test.

A-4 DETERMINATION OF SULPHATES

A-4.1 Reagents

A-4.1.1 *Concentrated Hydrochloric Acid* (*see* IS 265)

A-4.1.2 *Rectified Spirit* — 95 percent by volume (*see* IS 323)

A-4.1.3 *Barium Chloride Solution* — Approximately 10 percent (*m*/*v*).

A-4.1.4 *Dilute Hydrochloric Acid* — Approximately one percent (*v*/*v*).

A-4.1.5 *Concentrated Sulphuric Acid* (*see* IS 266)

A-4.1.6 *Concentrated Nitric Acid* (*see* IS 264)

A-4.2 Procedure

Weigh accurately about 5 g of the dried sample (*see* **A-2.1**) and dissolve in 20 ml of water. Filter, if necessary, into a 250 ml beaker. Add to the solution or filtrate 35 ml of concentrated hydrochloric acid and 25 ml of rectified spirit. Boil until all the chromate is reduced to the green trivalent form. Dilute the solution to 150 ml with water, heat to boiling and add slowly 20 ml of hot barium chloride solution. Continue boiling for 15 min, and allow it to stand for 4 h. Filter the solution containing barium sulphate through a tared Gooch crucible or a filter paper (Whatman No. 42 or equivalent). Wash with dilute hydrochloric acid till it is free from chromium salts and then with water till it is free from chlorides. Ignite the precipitate at 600 to 700 °C. Cool and add 2 drops of concentrated nitric acid and 2 drops of concentrated sulphuric acid and gently heat to drive off acid fumes. Then ignite again till constant mass is obtained.

A-4.2.1 Excess of barium chloride is necessary to reduce the solubility of barium sulphate. Precipitation in hot solution by addition of barium chloride in a slow stream with stirring minimizes mechanical occlusion of barium chloride and gives a coarse precipitate which is less soluble in acids.

A-4.3 Calculation

$$\text{Sulphate (as N}a_2SO_4\text{), percent by mass} = \frac{60.86\,M_1}{M}$$

where,

M_1 = Mass in g of the ignited precipitate, and

M = Mass in g of the material taken for the test.

A-4.3.1 Obtain sulphate as in **A-4.3**, (X), and calculium as in **A-6.3**. Equate the calcium with the sulphate required by it, (Y). Then (X-Y) will represent the sulphate combined with sodium. Calculate the sodium sulphate quantity from this figure.

A-4.4 Alternatively, sulphates can also be determined by a method given in **A-9.**

A-5 DETERMINATION OF CHLORIDES

A-5.1 Reagents

A-5.1.1 *Calcium Carbonate* — Solid.

A-5.1.2 *Standard Silver Nitrate Solution* — 0.1 N.

A-5.1.3 *Potassium Chromate Indicator Solution* — Dissolve 5 g of potassium chromate in 100 ml of water.

A-5.2 Procedure

Weigh accurately about 5 g of the dried material (*see* **A-2.1**) and transfer into a 250 ml conical flask. Dissolve the weighed sample in 50 ml of water. Add about 4 g of calcium carbonate to neutralize it and shake well. Titrate with standard silver nitrate solution to the end point to give a permanent brown precipitate or red colour.

A-5.2.1 Carry out a blank with 4 g of calcium carbonate in 50 ml of water, using potassium chromate indicator.

A-5.3 Calculation

$$\text{Chlorides (as NaCl), percent by mass} = \frac{(V_1 - V_2)N \times 5.85}{M}$$

where,

V_1 = Volume in ml of standard silver nitrate solution used in the titration with the material,

V_2 = Volume in ml of standard silver nitrate solution used in the blank determination,

N = Normality of standard silver nitrate solution, and

M = Mass in g of the material taken for the test.

A-5.4 Alternatively, chlorides can also be determined by method given in **A-9.**

A-6 DETERMINATION OF CALCIUM COMPOUNDS

A-6.1 Reagents

A-6.1.1*Ammonium Oxalate Solution* — Saturated.

A-6.1.2 *Methyl Red Indicator Solution* — Dissolve a15 g of methyl red in water and dilute the solution to 500 ml.

A-6.1.3 *Dilute Ammonium Hydroxide* — Approximately 5 N and 0.5 N.

A-6.1.4 *Dilute Sulphuric Acid* — 1: 4 (by volume).

A-6.1.5 *Standard Potassium Permanganate Solution* — 0.1 N.

A-6.2 Procedure

Weigh accurately about 5 g of the dried sample (*see* **A-2.1**) and dissolve in 50 ml of water. Filter, if necessary. Heat the filtrate and washings to boiling and add, with constant stirring, an excess of hot ammonium oxalate solution. Add 2 to 3 drops of methyl red indicator and to the hot solution maintained at 70 to 80°C add, with constant stirring, dilute ammonium hydroxide (5 N) dropwise, until the colour changes from red to yellow. Allow the solution to stand at 70 to 80°C for one hour, and then filter through a filter paper (Whatman No. 40 or its equivalent). Test the filtrate for the presence of calcium with ammonium oxalate solution before throwing it away. Wash the precipitate a few times with dilute ammonium hydroxide (0.5 N) until it is free from oxalates. Pierce the apex of the filter with a stirring rod, and wash the bulk of the precipitate through the funnel into a conical flask with hot water. Then wash the filter paper a few times with warm dilute sulphuric acid. Finally wash the filter paper thoroughly with hot water. Add about 30 ml of dilute sulphuric acid to the washings, dilute to 250 ml, heat to 60°C and titrate while hot with standard potassium permanganate solution.

A-6.3 Calculation

$$\text{Calcium (as Ca}SO_4\text{), percent by mass} = \frac{6.807\,VN}{M}$$

where,

V = Volume in ml of standard potassium permanganate solution required for the titration,

N = Normality of the standard potassium permanganate solution, and

M = Mass in g of the material taken for the test.

A-7 DETERMINATION OF MATTER INSOLUBLE IN WATER

A-7.1 Procedure

Weigh accurately about 10 g of the dried material (*see* **A-2.1**) and dissolve in 100 ml of water. Heat on a water-bath for 30 min. Filter the solution through a tared sintered glass crucible. Wash the residue, if any, with hot water and dry to constant mass at 105 to 110 °C.

A-7.2 Calculation

$$\text{Matter insoluble in water, percent by mass} = 100 \times \frac{M_1}{M_2}$$

where

M_1 = Mass in g of the residue, and

M_2 = Mass in g of the material taken for the test.

A-8 DETERMINATION OF pH VALUE

A-8.1 Apparatus

A-8.1.1 *p*H *Meter* — A suitable *p*H meter fitted with glass and calomel electrodes.

A-8.2 Procedure

Weigh 5.0 g of the material in a beaker, add 50 ml of freshly boiled and cooled water and stir to dissolve. Measure the *p*H of the solution with the help of *p*H meter.

A-9 ION CHROMATOGRAPHY FOR CHLORIDES AND SULPHATES

A-9.1 Principle

Ion Chromatography is an innovative method for the determination of ions. The technique is used for the analysis of chlorides and sulphates. The technique separates ions and polar molecules based on their affinity to ion exchanger. When the method is employed for the determination of the anions as chlorides and sulphates, the identification should be made by using a matrix covering the ions of interest. In cation exchange chromatography, the stationary phase is functionalized with anions. These anions will attach cations towards it. These surface bound molecules/ionic species can then be removed by using a suitable eluent containing substituted ions to replace them or they can be removed by changing the *p*H of the column. Similarly in anion exchange chromatography, the stationary phase is cationic in nature. These cations will then separate the anions.

Conductivity detector is generally used in this method. In case of suppressor ion exchange chromatography, analyte ions are separated on the ion exchange column and these ions together with the eluent move to the matrix suppressor. The eluent conductivity is lowered in the suppressor and the sample ion conductivity is increased leading to the large increase in signal to noise ratio.

A-9.2 Equipments

A-9.2.1 *Anion Guard Column* — A protector of the separator column

A-9.2.2 *Anion Separator Column* — Suitable for selective separation of ions under analysis.

A-9.2.3 *Anion Suppressor Device* — Anion micro-membrane suppressor is used to analyse the data

A-9.2.4 *Detector* — Conductivity detector

A-9.2.5 *Software* — Software suitable for control of various operating parameters, receiving inputs and analysis of all data.

A-9.2.6 Sample loop of 100 µl, 200 µl, 500 µl or 1 000 µl be used to determine ionic concentration as per instrument manual and practice.

A-9.3 Reagents

A-9.3.1 Glass or polyethylene sample bottles.

A-9.3.2 Distilled water or deionized water free from the anions of interest.

A-9.3.3 *Eluent*

1.7 mM of sodium bicarbonate and 1.8 mM of sodium carbonate solution is used. For preparation of these solution, 0.285 6 g of sodium bicarbonate and 0.381 6g of sodium carbonate is dissolved in 2 l of water.

A-9.3.4 *Micromembrane Suppressor Solution* — (0.025 N of sulphuric acid)- Dilute 2.8 ml of concentrated sulphuric acid in 4 l of water.

A-9.4 Standard Solutions

A-9.4.1 *Chloride* — Dissolve NaCl, 1.6485 g in 1 lof reagent water.

A-9.4.2 *Sulphate* — Dissolve 1.81 g of potassium sulphate in 1 l of reagent water.

A-9.5 Calibration and Standardization

For each analyte of interest, prepare calibration standards at three concentration levels and a blank by adding measured stock standards and diluting with reagent water. If the concentration of the sample exceeds the calibration range, the sample may be diluted. Using 0.1-1.0 ml injections of each calibration standard, tabulate area responses or peak height against the concentration. Use these results to prepare calibration curve. Record the retention time during the procedure.

A-9.6 Procedure

Dissolve between 1 to 5 g sample in 25 ml reagent grade water in PTTE/HDPE (High Density Polyethylene) beaker and use this solution for analysis. Inject a well-mixed sample (0.1-1.0 ml) and flush it through an injection loop using each new sample. Use the loop of same size for the standards and samples. Record the peak in size and area units. An automated constant volume injection system may preferably be used. The width of peak for retention time of ions should be same for sample and standard. Dilute the sample with the help of reagent water if the response for the peak exceeds the working range of the system for analysis. If required, spike the sample with an appropriate amount of standard and reanalyze incase of absence of distinct resolution. Retention time is inversely proportional to concentration. For solid sample of cobalt acetate, following extraction procedure may be used.

Add reagent water in an amount equal to 10 times the dry weight of the sample. The slurry is made and stirred for about 10 min using magnetic stirrer. This slurry is filtered from 0.45 µ membrane. This membrane can be directly attached to the end of the syringe. For clear resolution, the sample can further be diluted. The dilution should be made to an extent till there is no deviation from the method.

A-9.7 Data Analysis and Calculations

Prepare a calibration curve for each analyte by plotting instrument response against concentration. Compare the sample response with the standard curve and compute sample concentration. Multiply the value by appropriate dilution factor.

Report results in mg/L or by suitably modifying into percentage. Only report those values that fall within the range of lowest and highest calibration standards.

ANNEX B

(*Clause* 5.1)

SAMPLING OF SODIUM BICHROMATE, TECHNICAL

B-1 GENERAL REQUIREMENTS OF SAMPLING

B-1.1 In drawing, preparing, storing and handling samples, the following precautions shall be observed.

B-1.1 Samples shall not be taken in an exposed place.

B1.2 The sampling instrument shall be clean and dry.

B-1.3 Precautions shall be taken to protect the sample, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

B-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed thoroughly by suitable means.

B-1.5 The samples shall be placed in clean, dry and air-tight glass or other suitable containers on which the material has no action.

B-1.6 The sample containers shall be of such a size that they are almost but not completely filled with the sample.

B-1.7 Each sample container shall be sealed air-tight after filling and marked with full details of sampling, the date of sampling, the year of manufacture and other important particulars of the consignment.

B-2 SCALE OF SAMPLING

B-2.1 Lot

All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute a lot. If a consignment is declared or known to consist of different batches of manufacture, the containers belonging to the same batch shall be grouped together and each such group shall constitute a separate lot.

B-2.1.1 Samples shall be tested from each lot for ascertaining conformity of the material to the requirements of the specification.

B-2.2 The number of containers (n) to be chosen from a lot shall depend on the size of the lot (N) and shall be in accordance with Table 2.

Table 2 Number of Containers to be Selected for Sampling

(Clause B-2.2)

Sl No. (1)	Lot Size (*N*) (2)	Number of Containers to be Selected (*n*) (3)
i)	3 to 50	3
ii)	51 to 200	4
iii)	201 to 400	5
iv)	401 to 650	6
v)	651 and above	7

B-2.3 The containers to be selected for sampling shall be chosen at random from the lot and for this purpose random number tables shall be used. In case such tables are not available, the following procedure may be adopted:

Starting from any container, count them in one order as 1, 2, 3 . . . . . . , upto r and so on, where r is the integral part of N/n. Every r^th^ container thus counted shall be taken out.

B-3 TEST SAMPLES AND REFEREE SAMPLE

B-3.1 Preparation of Test Samples and Referee Sample

B-3.1.1 Draw with an appropriate sampling instrument a small portion of the material from different parts of each container selected for sampling. The total quantity of the material drawn from each container shall be sufficient to conduct the tests for all the characteristics given under **2**.

B-3.1.2 Thoroughly mix all portions of the material drawn from the same container. Out of these portions a small but equal quantity shall be taken from each selected container and shall be well mixed up together so as to form a composite sample weighing not less than 300 g. This composite sample shall be divided into three equal parts, one for the purchaser, the second for the supplier and the third to be used as referee sample.

B-3.1.3 The remaining portion of the material from each container (after a small quantity needed for the formation of composite has been taken out) shall be divided into three equal parts, each part weighing not less than 10 g. These parts shall be immediately transferred to thoroughly dried bottles which are then sealed air-tight with stoppers and labeled with all the particulars of sampling given in **B-1.7**. The material in each such sealed bottle shall constitute an individual test sample. These individual samples shall be separated into three identical sets of samples in such a way that each set has an individual test sample representing each container selected. One of these three sets shall be for the purchaser, the second for the supplier and the third shall be used as referee sample.

B-3.2 The referee sample consisting of the composite sample (*see* **B-3.1.2)** and a set of individual samples (*see* **B-3.1)** shall be marked for this purpose and shall bear the seals of the purchaser and the supplier. It shall be kept at a place agreed to between the purchaser and the supplier and shall be used in case of dispute between the two.

B-4 NUMBER OF TESTS

B-4.1 Tests for the determination of sodium bichromate shall be conducted on each of the individual samples constituting the set of test sample.

B-4.2 Tests for the remaining characteristics shall be conducted on the composite sample.

B-5 CRlTERIA FOR CONFORMITY

B-5.1For Individual Samples

The mean and the range of the test results for the determination of sodium bichromate shall be calculated as follows:

Mean ($\overline{x}$) = The sum of the test results divided by the number of test results, and

Range (R) = The difference between the maximum and the minimum values of the test results.

B-5.1.1 If ($\overline{x}$ - 0.6 R) is equal to or greater than the minimum requirement of sodium bichromate, the lot shall be declared to have satisfied the requirement for sodium bichromate.

B-5.2 For Composite Sample

The test results on the composite sample shall meet the corresponding requirements specified in **2**.

B-5.3 A lot shall be declared as conforming to this specification if it satisfies the requirements for each of the characteristics listed in **2.**

B-5.4 If the requirement for any of the characteristics are not met, the lot shall be declared to have not satisfied the requirements of this specification.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Organization	*Representative(s)*
Central Salt and Marine Chemicals Research Institute, Bhavnagar	DR KANNAN SRINIVASAN, (***Chairman***) CHD 1
Alkali Mfrs Association of India, Delhi	SHRI K. SRINIVASAN SHRI H. S. DAS (*Alternate*)
Bhabha Atomic Research Centre, Mumbai	DR A. V. R. REDDY DR S. N. ACHARY (*Alternate*)
Central Drugs Standard Control Organization	DR RAMAN MOHAN SINGH
CONSUMER VOICE, Delhi	SHRI MAU KHAN SHRI K. C. CHAUDHARY (*Alternate*)
Delhi Jal Board	SHRI ASHUTOSH KAUSHIK
DGQA, New Delhi	DR. GURBACHAN SINGH SHRI B S TOMAR (*Alternate*)
Geological Survey of India, Kolkata	SHRI P V V R SARMA
Global Adsorbents Pvt Ltd, Kolkata	SHRI SANJAY DHANUKA
Grasim Industries Ltd., Nagda	SHRI ALOK SINGH SHRI PANKAJ GUPTA (*Alternate*)
Gujarat Alkalies and Chemicals Ltd, Vadodara	SHRI V K MAHIDA SHRI SHAILESH PATEL (*Alternate*)
Hindalco	SHRI NAGESWAR KAPURI SHRI AJITH RAMACHANDRA (*Alternate*)
Hindustan Lever Ltd., Mumbai	MS VRINDARAJWADE SHRI SOJAN VARGHESE (*Alternate*)
Industrial Carbon Pvt.Ltd., Ankleshwar	SHRI SATYAN ROHIT KUMAR

Organization	*Representative(s)*
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Indian Institute of Chemical Technology, Hyderabad	DR PRAVEEN R LIKHAR DR RAJENDER REDDY (*Alternate*)
Ministry of Defence (DGQA), Kanpur	SHRI R. N. APARAJIT
Ministry of Chemicals & Fertilizers	DR. ROHIT MISRA DR O P SHARMA (*Alternate*)
National Chemical Laboratory, Pune	DR. DARBHA SRINIVAS DR. PARESH DHEPE (*Alternate*)
National Metallurgical Laboratory, Jamshedpur	DR. TRILOCHAN MISHRA SHRI DEVBRATA MISHRA (*Alternate*)
National Mineral Development Corporation Ltd., Hyderabad	SHRI RAJAN KUMAR DR PRASHANT SHARMA (*Alternate*)
National Peroxide Ltd	DR JOY ANTHONY
National Physical Laboratory, New Delhi	DR NAHAR SINGH DR S. P. SINGH (*Alternate*)
National Test House (NR)	MS RICHAKUNDRA
Office of the Development Commissioner (MSME), New Delhi	DR KARTHIKEYAN MS ANNA BACKIAM (*Alternate*)
Shriram Institute for industrial research, Delhi	DR (MS) LAXMI RAWAT SHRI B. GOVINDAN (*Alternate*)
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Tata Chemicals Ltd., Gujarat	SHRI NAJMUL HASAN KHAN
The DharamsiMorarji Chemicals Co. Ltd.	SHRI MANDAR GAIKWAD
Vaibhav Analytical Services, Ahmedabad	SHRI. GAURANG OZA
In Personal Capacity	SHRI R S BAGHEL

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Member Secretary
SHRI SAGAR SINGH
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